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Okouchi

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(54) **POWER TOOL**

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B25F 5/02	(2006.01)
G05G 1/08	(2006.01)
G05G 5/06	(2006.01)

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CPC . ***B27B 17/14*** (2013.01); ***B25F 5/02*** (2013.01); ***G05G 1/082*** (2013.01); ***G05G 5/06*** (2013.01)
USPC **173/171**; 227/8

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CPC B27B 17/00; B27B 17/02; B27B 17/04; B25D 11/00; B25D 11/04
USPC 173/171, 170, 48; 30/381; 227/8; 81/16
See application file for complete search history.

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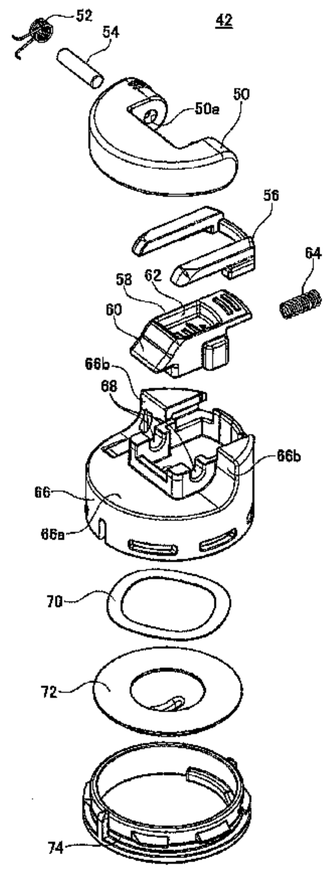
(57) **ABSTRACT**

A fixed operating knob is rotatably arranged on a chain saw body. The fixed operating knob comprises a knob body, a tab, a torsion spring, and a lock member. The knob body is rotatably attached to the chain saw body. The tab is attached to the knob body. The tab is attached so as to be capable of swinging between an operating position projecting from the knob body and a storing position stored in the knob body. The torsion spring biases the tab toward the operating position. When the tab moves to the storing position, the lock member retains the tab at the storing position against a biasing force of the torsion spring.

5 Claims, 12 Drawing Sheets



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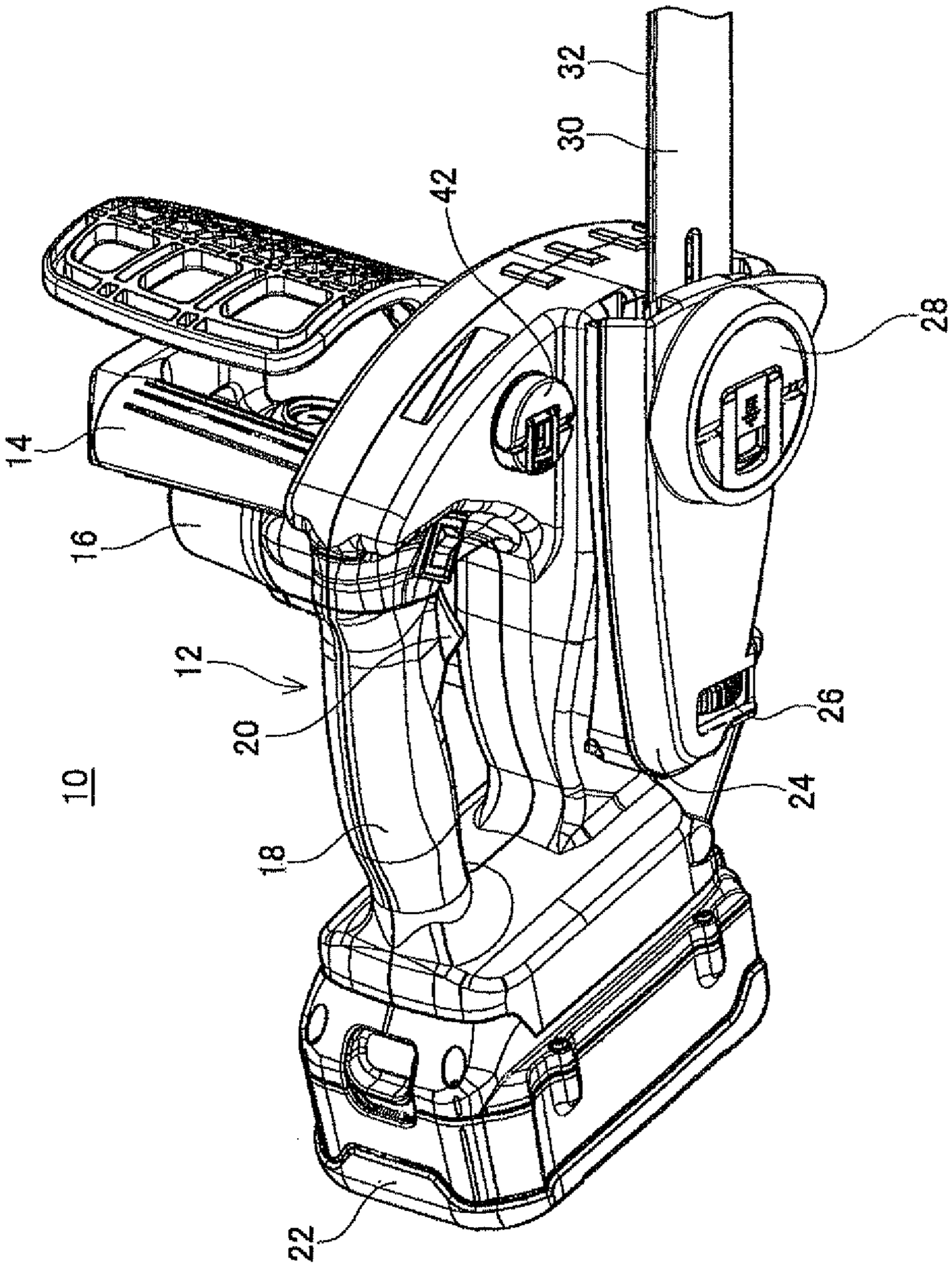


FIG. 1

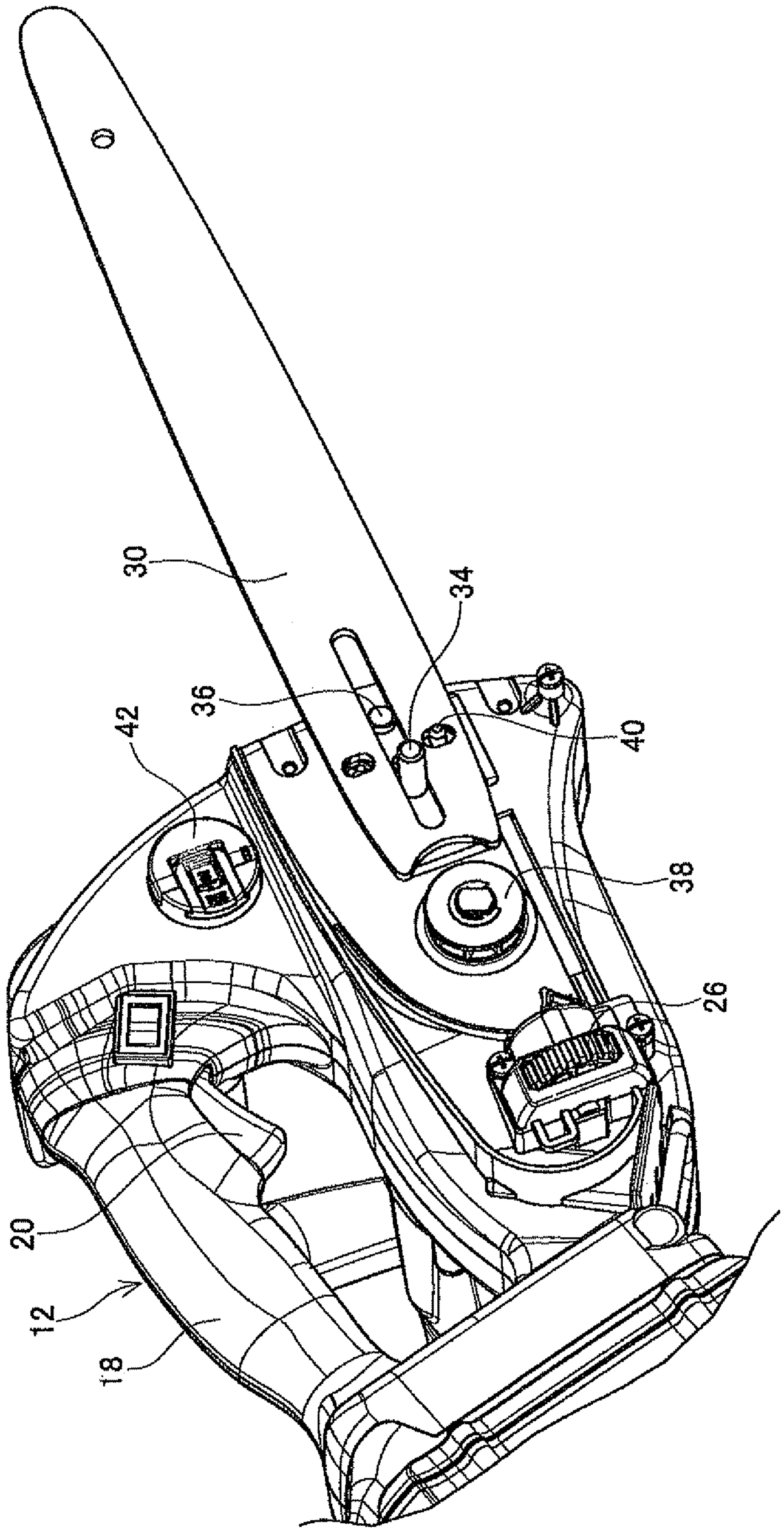
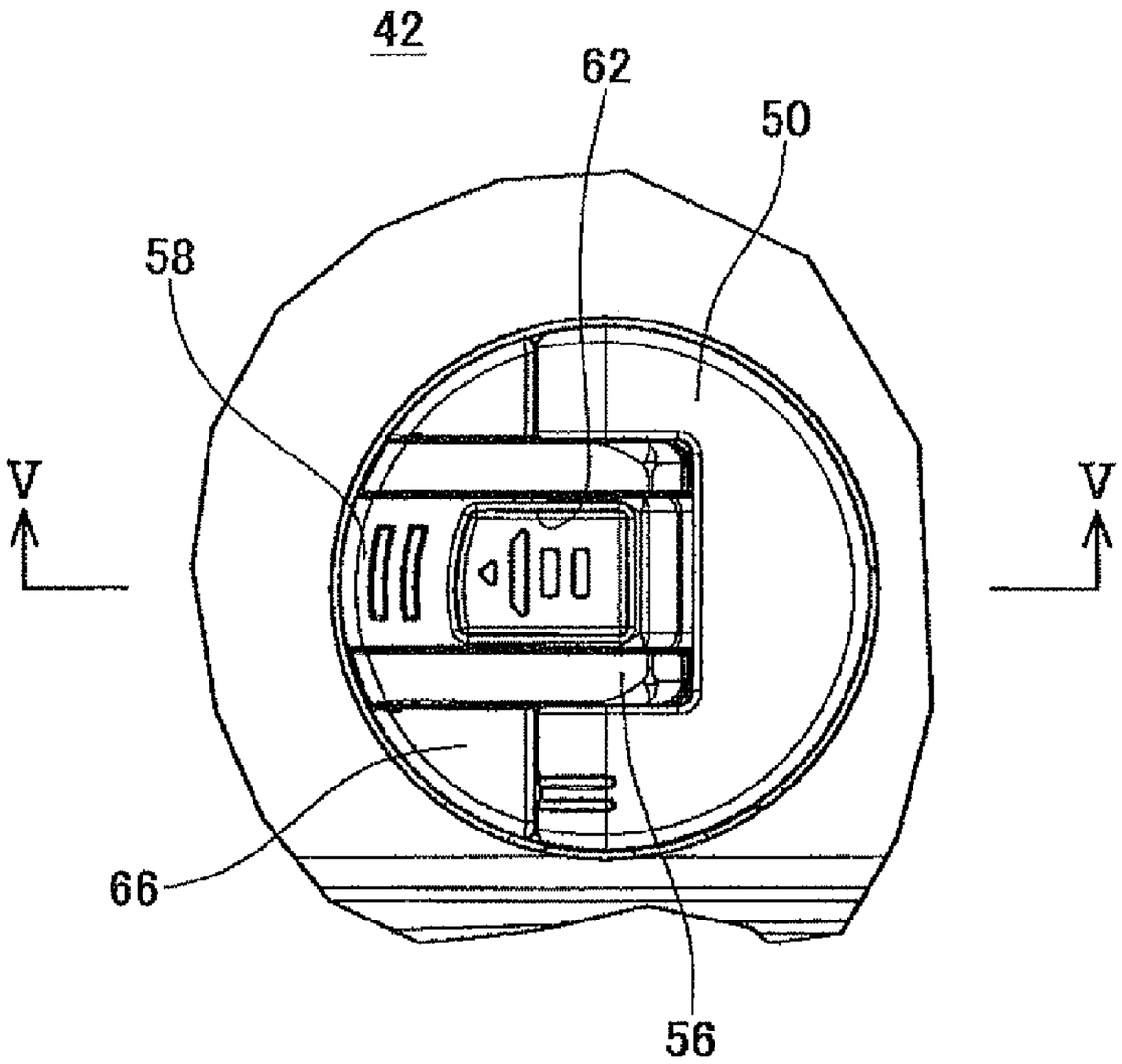


FIG. 2

FIG. 3



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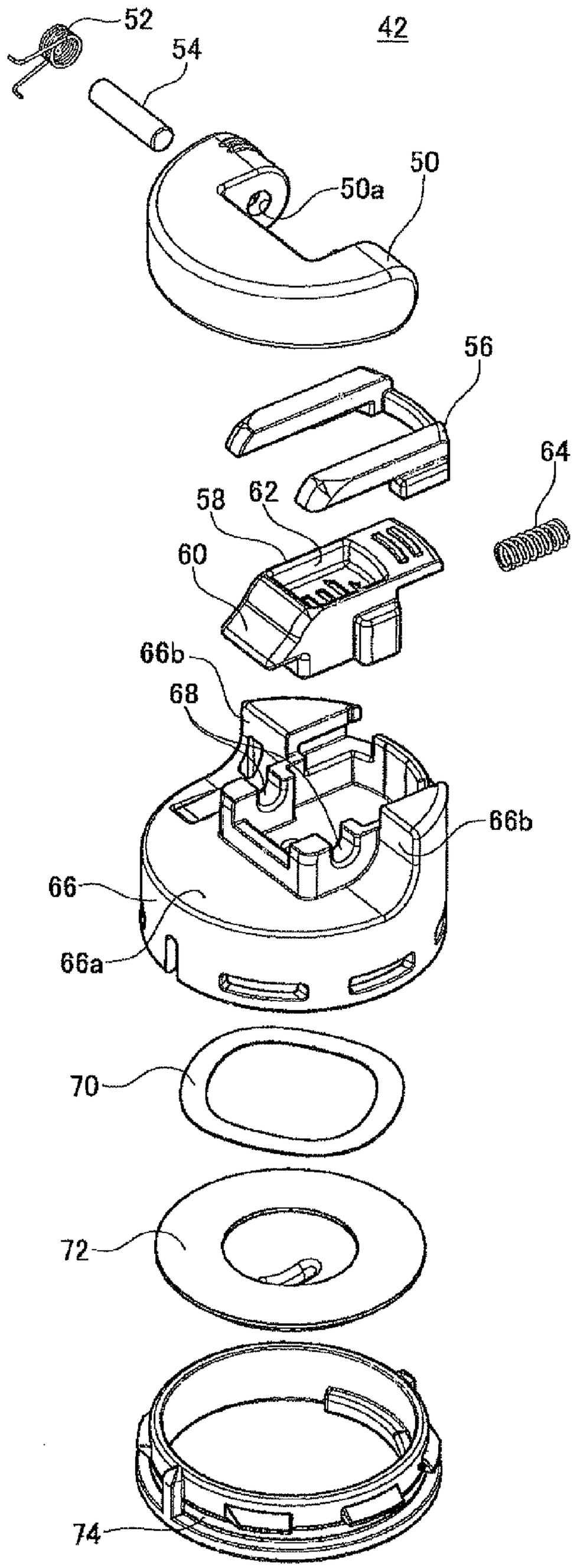

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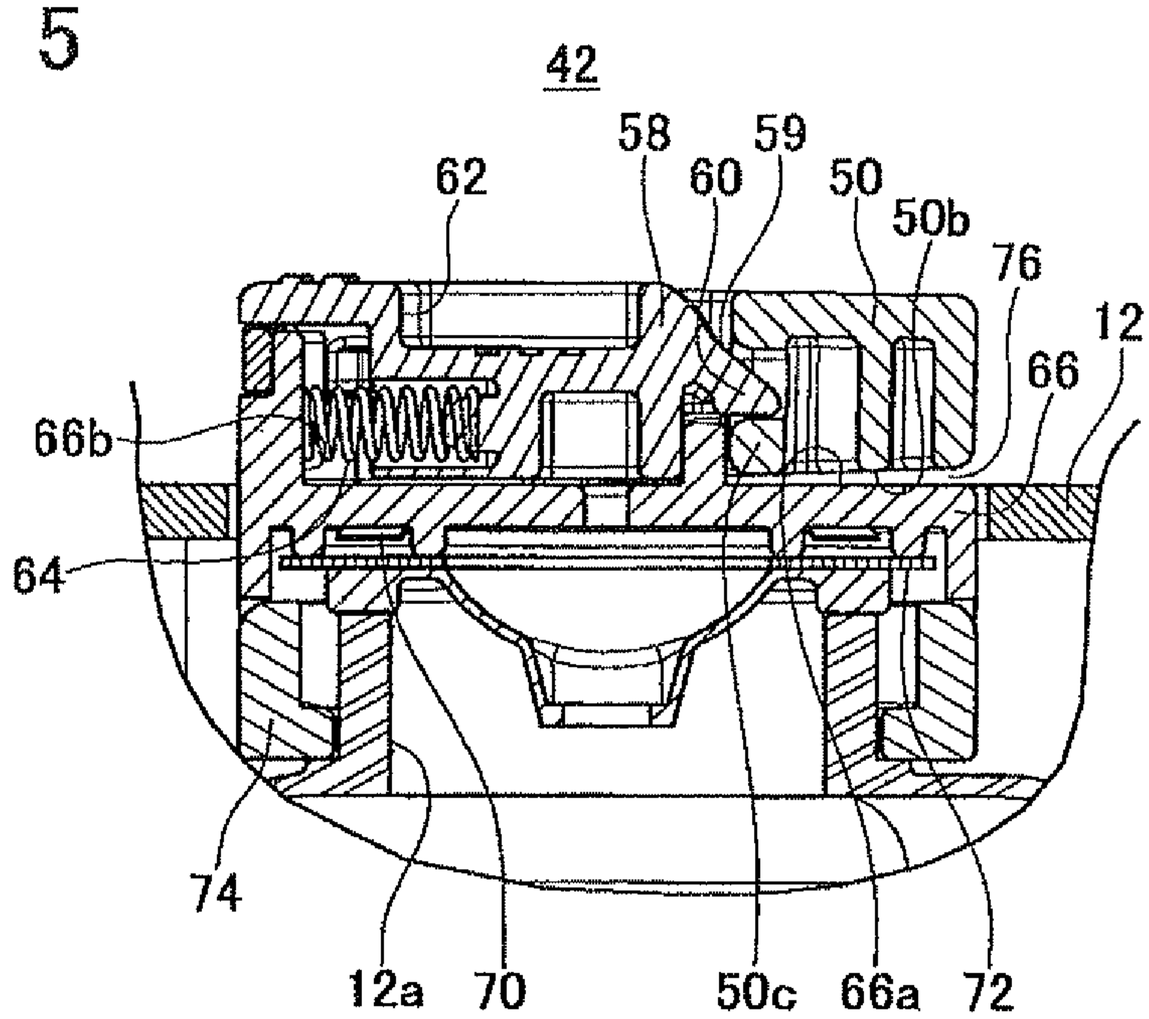
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74
12a
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50c
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FIG. 6

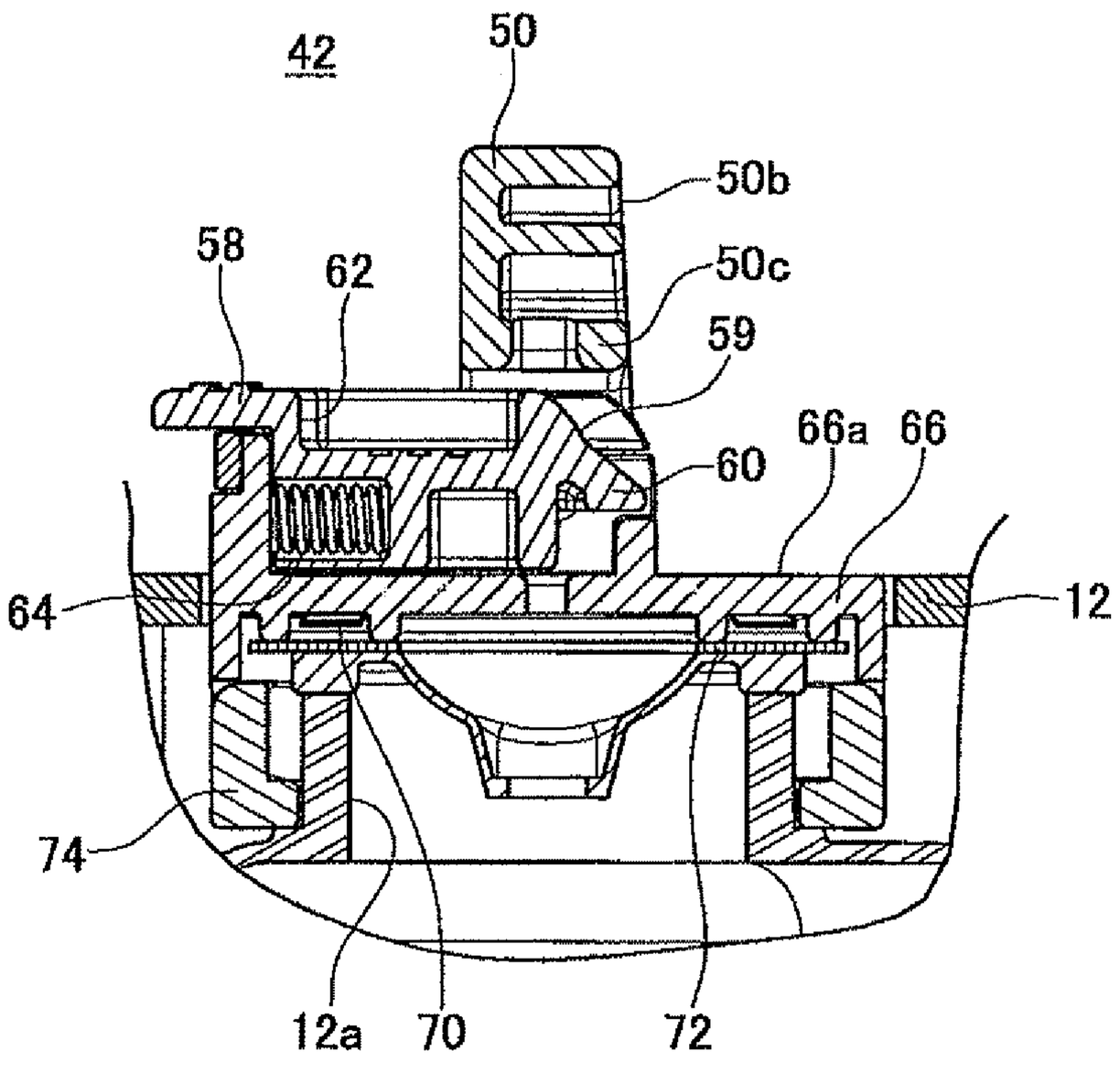
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FIG. 7

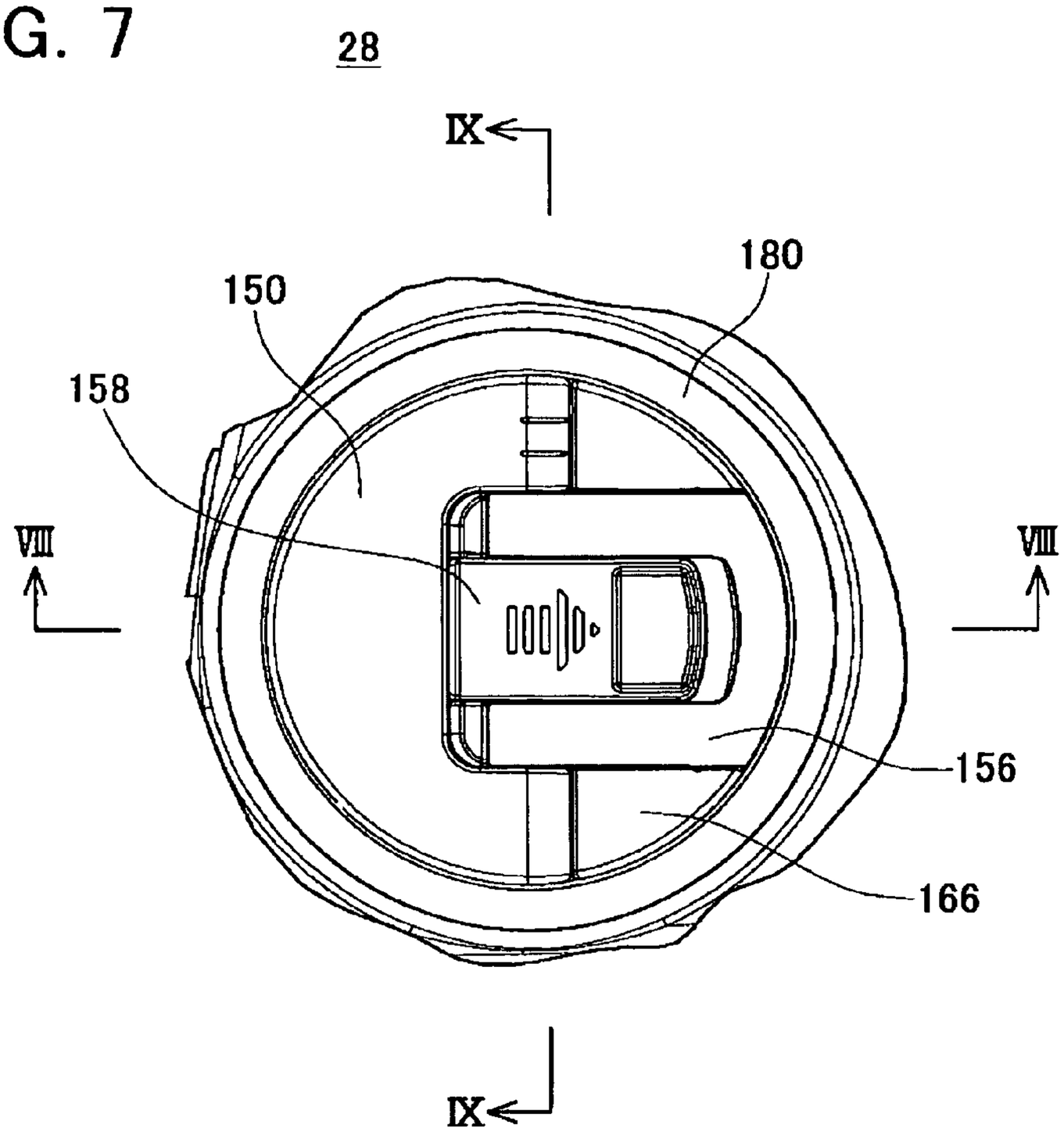

FIG. 8

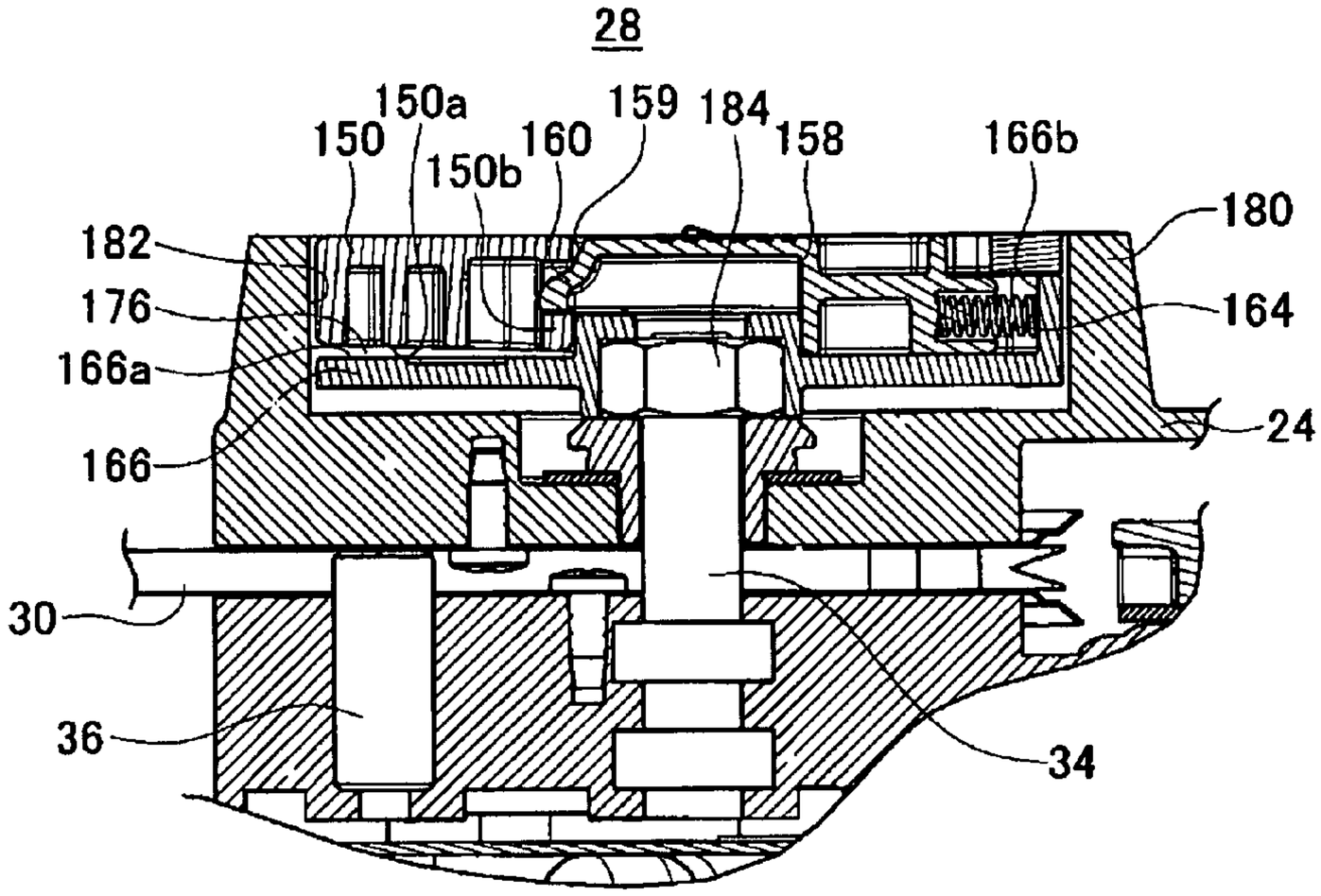
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FIG. 9

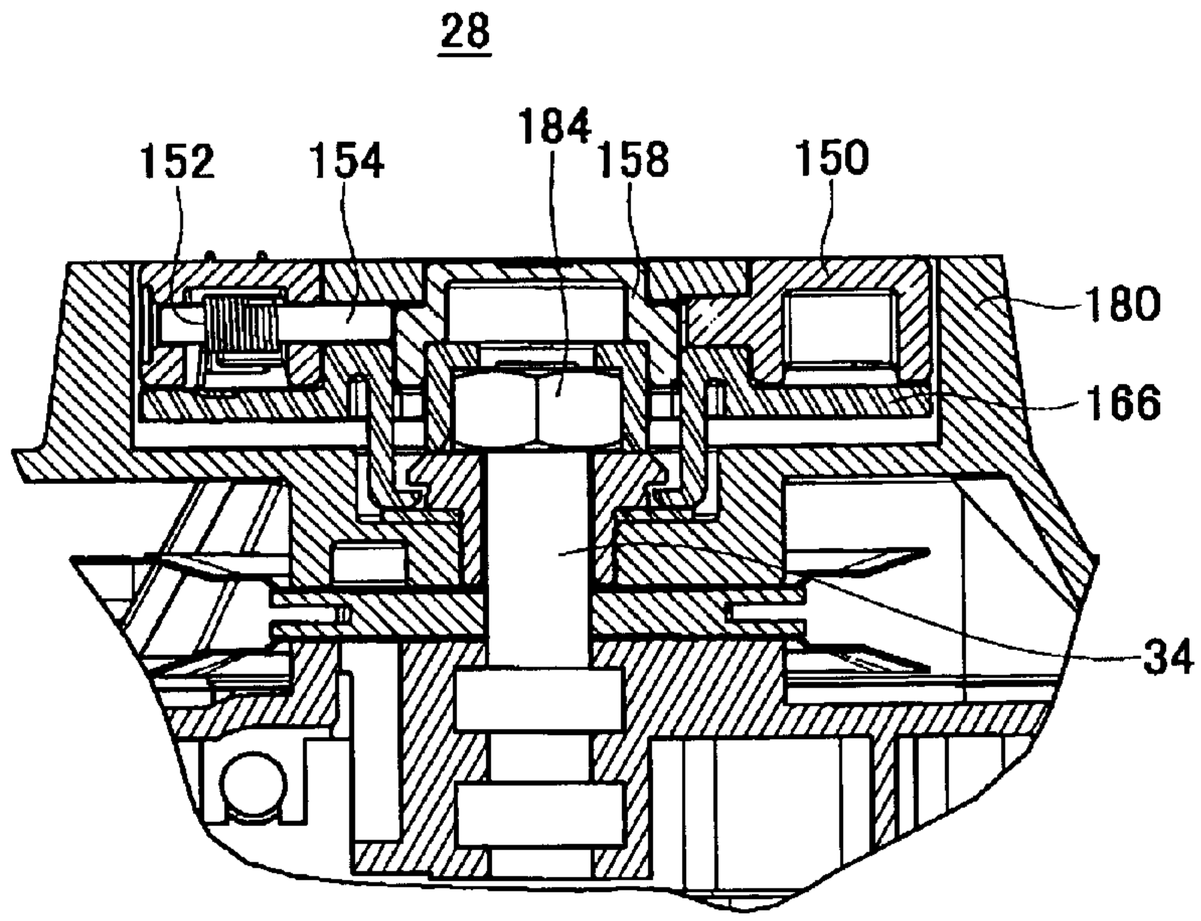
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FIG. 10

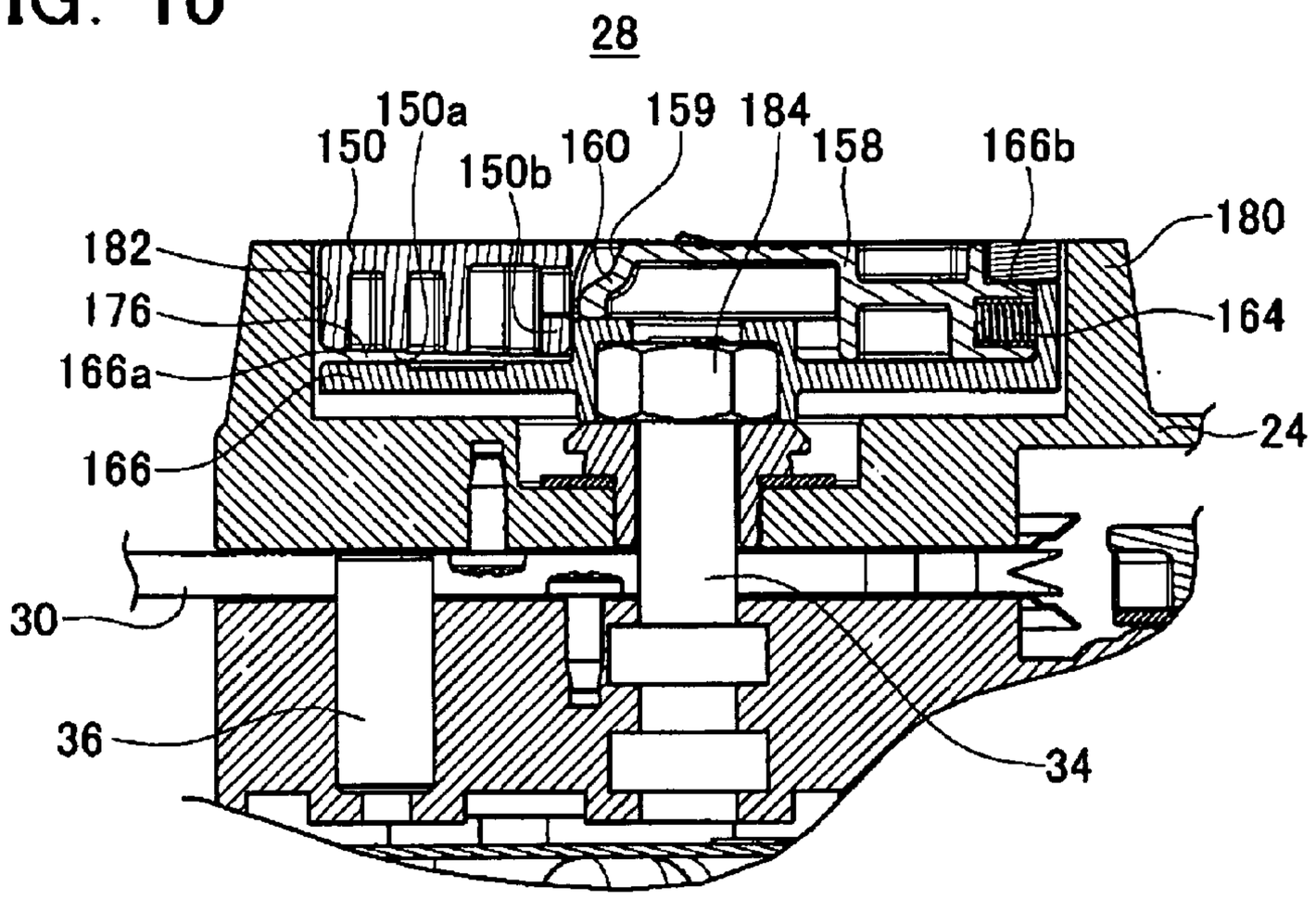
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FIG. 11

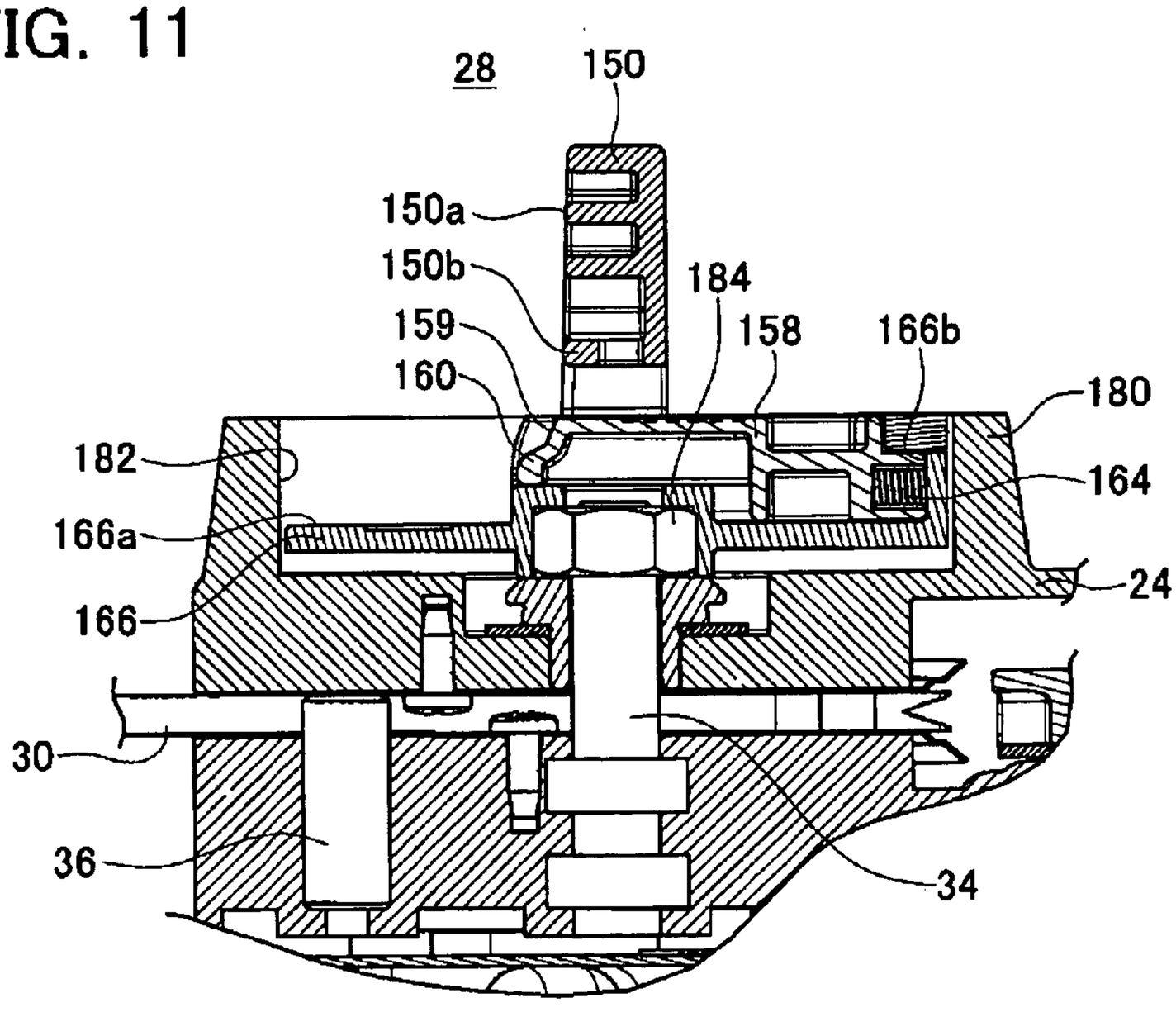
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FIG. 12

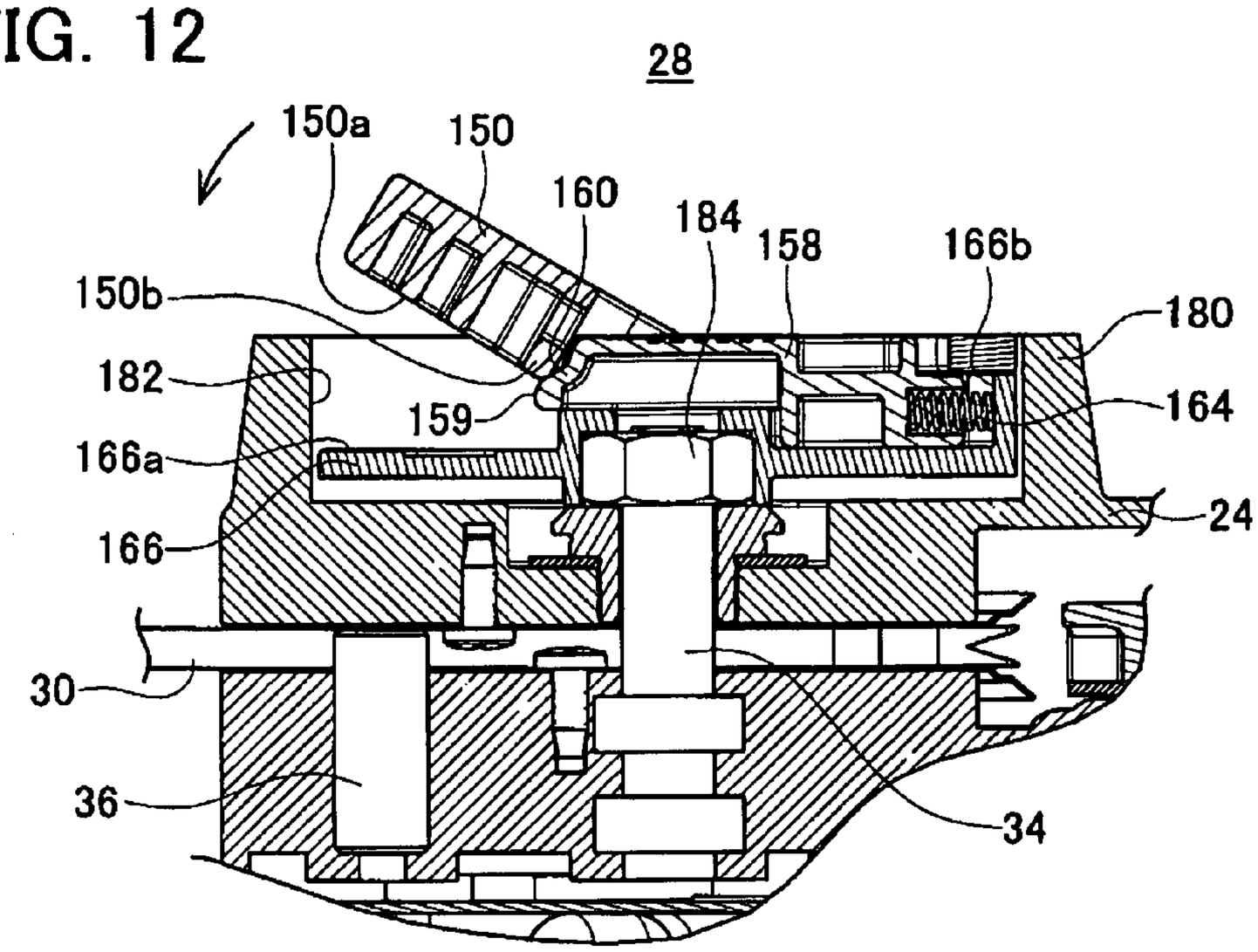
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FIG. 13

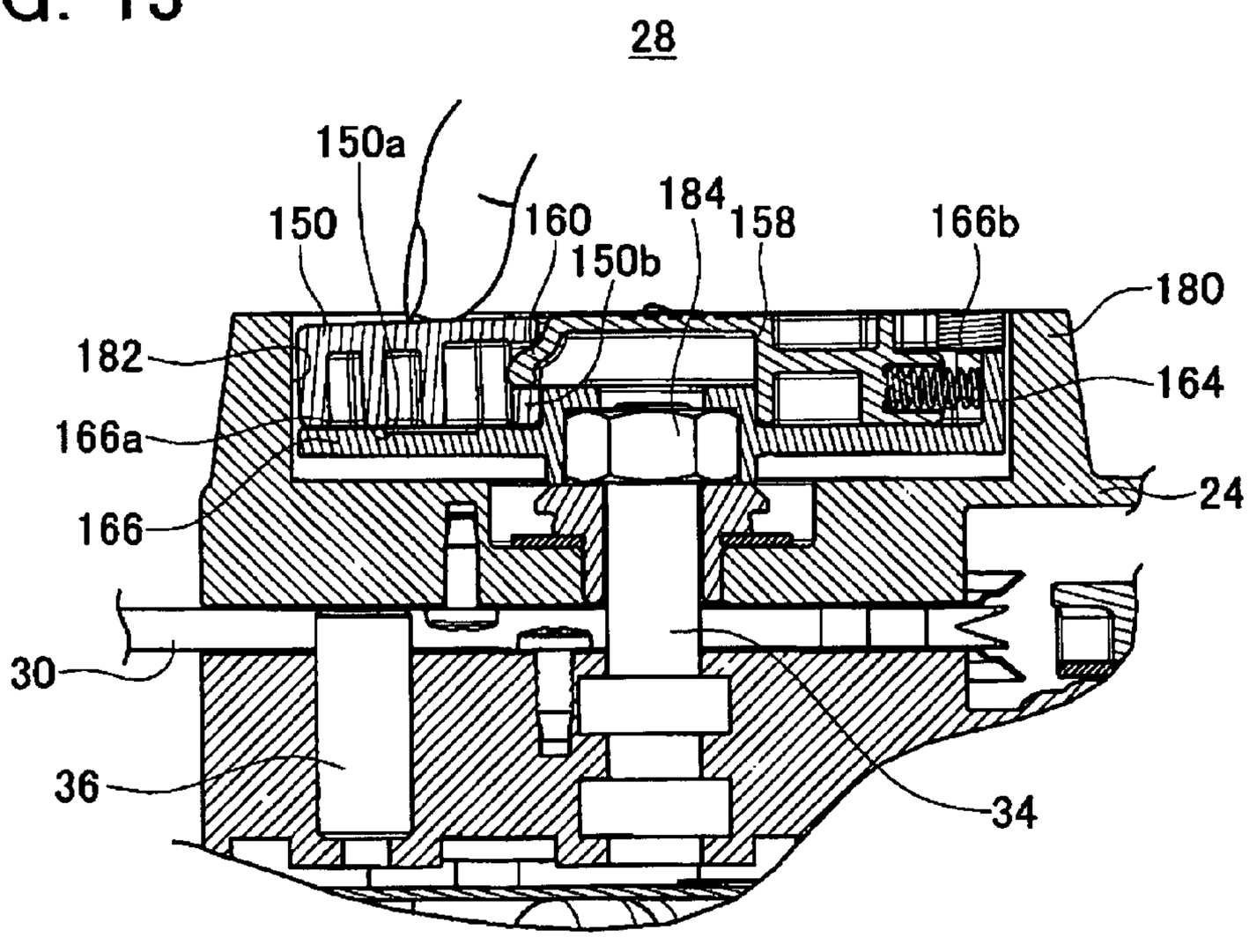
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FIG. 14

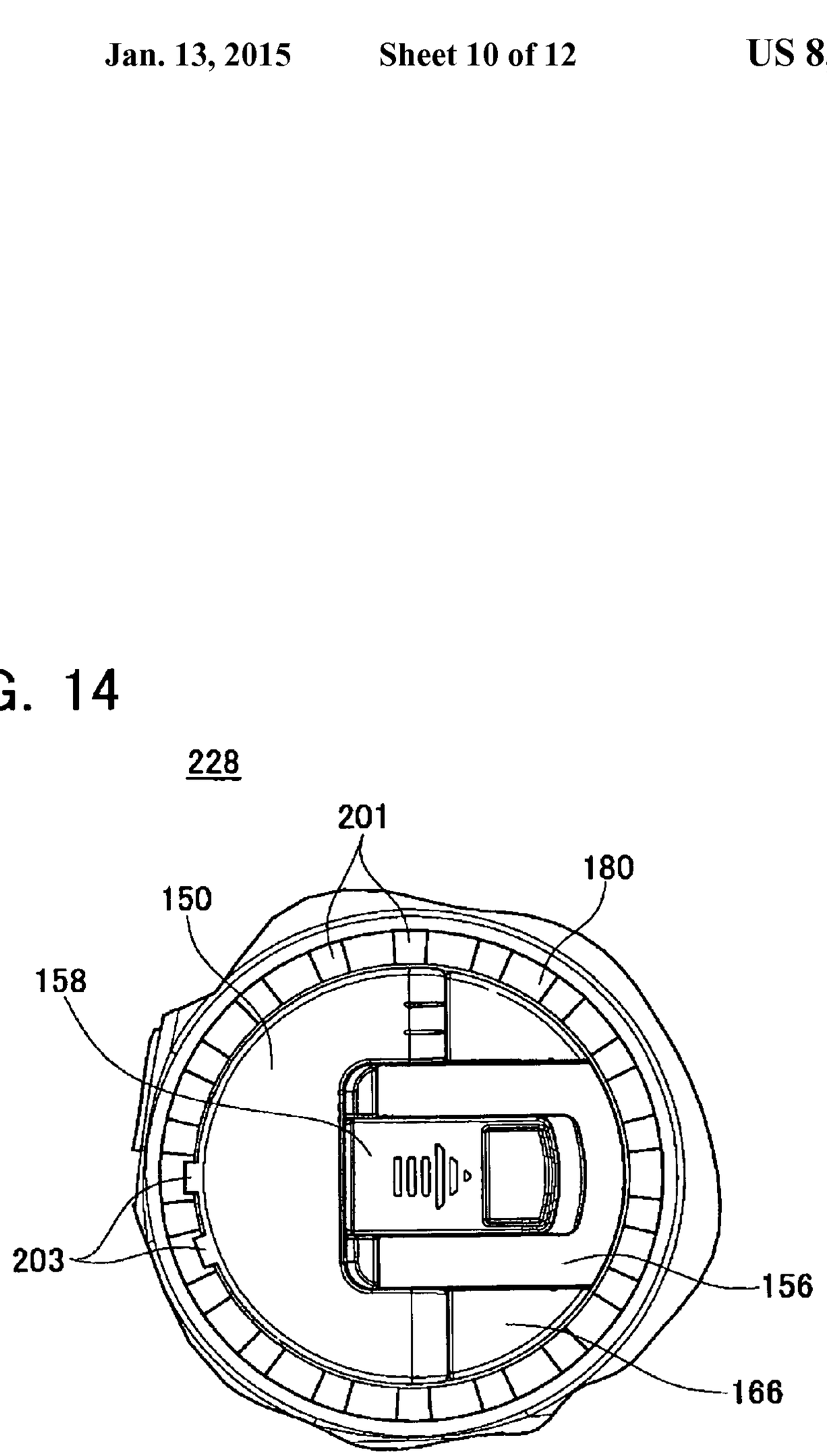


FIG. 15

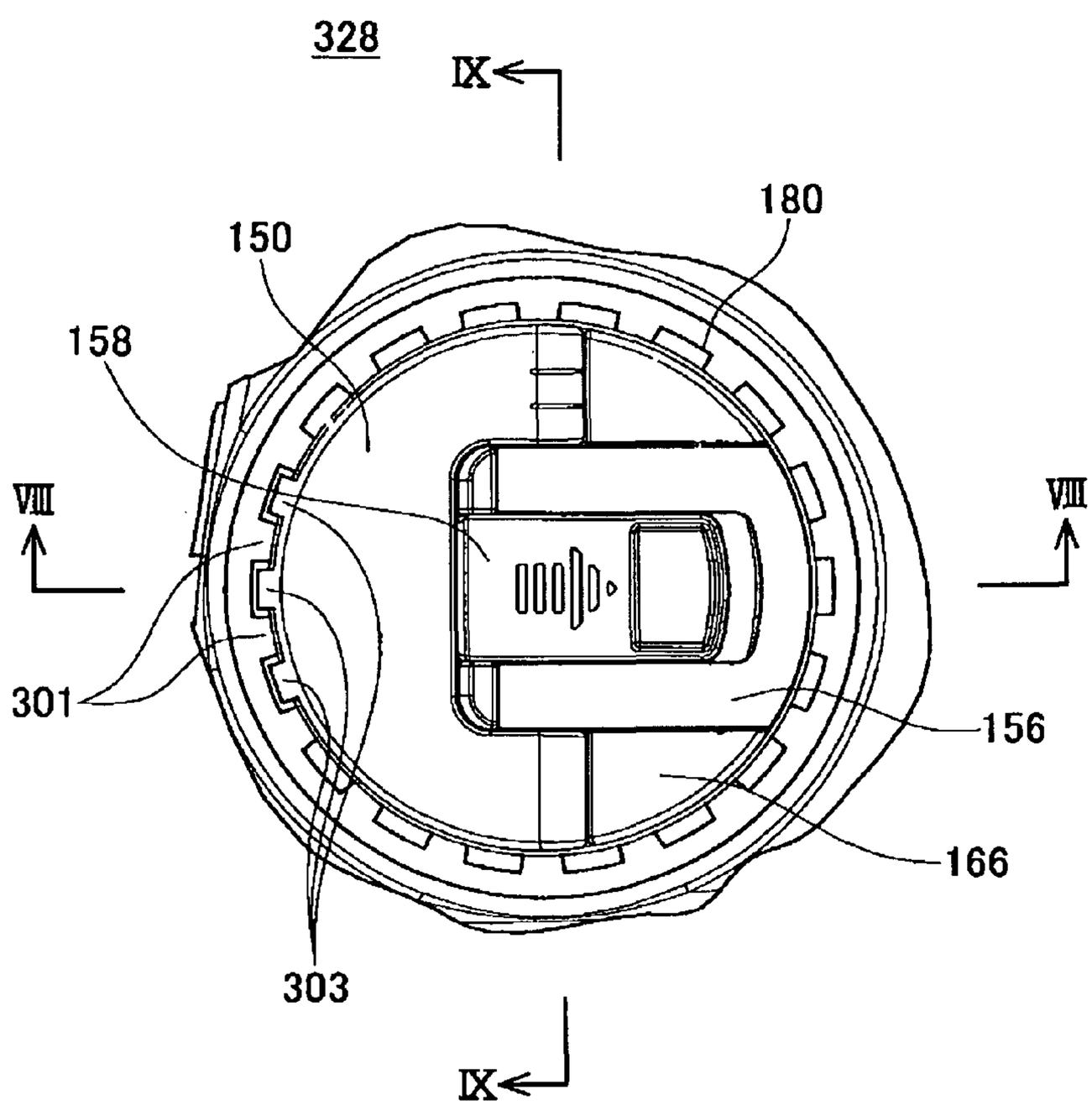
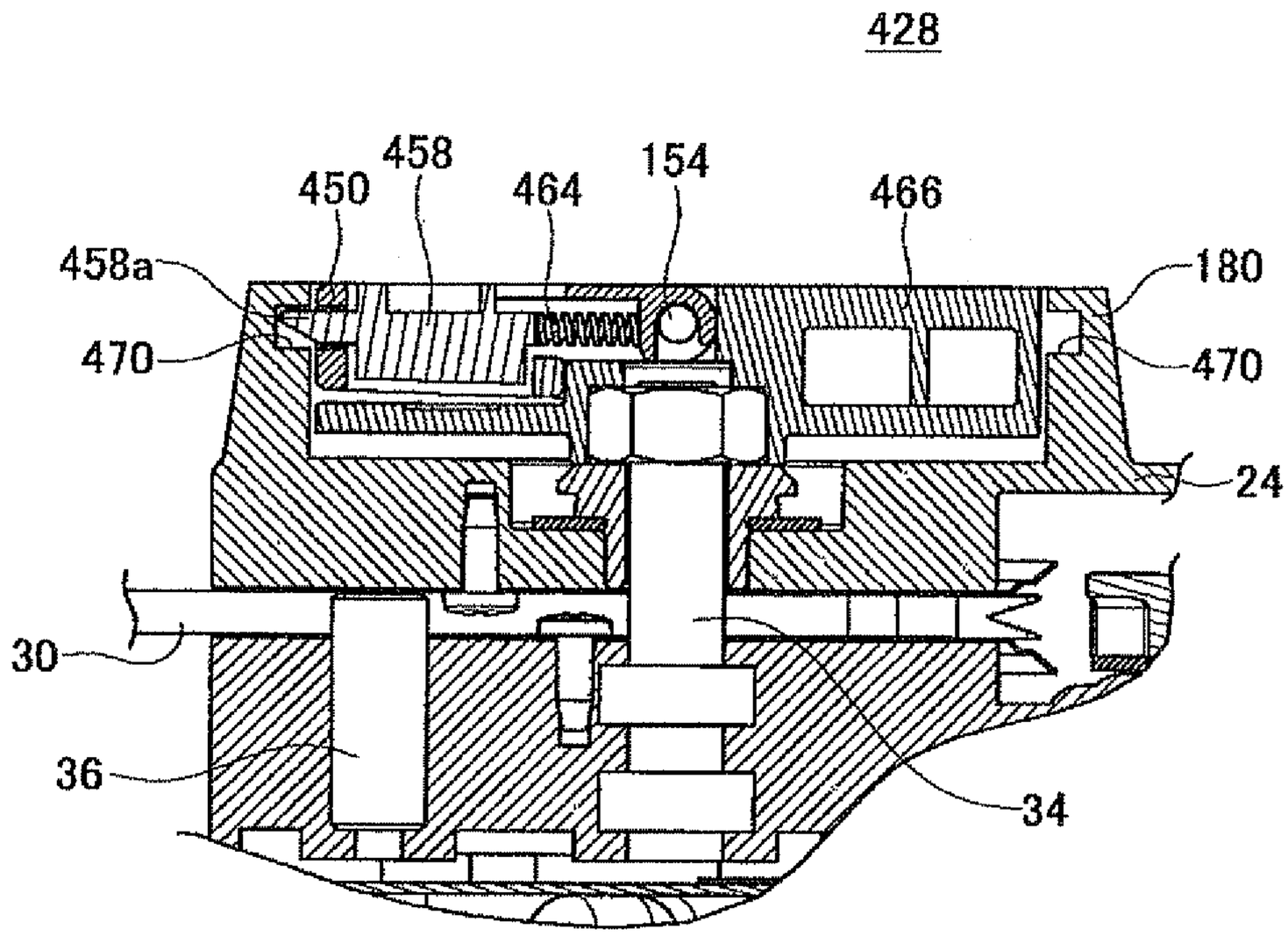


FIG. 16



POWER TOOL

TECHNICAL FIELD

The present specification discloses a power tool. In particular, the present specification discloses an art for enhancing operability of a rotation knob rotatably arranged on a power tool body and operated by a user.

BACKGROUND ART

Japanese Patent Application Laid-open No. 2006-103301 discloses a chain saw that is a type of power tool. According to the disclosure, the chain saw comprises a retaining assembly that is a type of a rotation knob rotatably arranged on a chain saw body. The rotation knob comprises a knob body and a tab attached to the knob body. The tab is arranged on the knob body so as to be capable of swinging between a storing position and an operating position. When the tab is at the operating position, the tab stands upright perpendicular to the knob body. An operator can hold the tab and rotatably operate the rotation knob by moving the tab from the storing position to the operating position. The tab is biased from the operating position toward the storing position by a torsion spring. In this configuration, when the operator releases a finger from the tab, the tab swings from the operating position to the storing position due to a biasing force of the torsion spring.

SUMMARY OF INVENTION

Technical Problem

With the rotation knob described above, when operating the tab, the tab is constantly biased from the operating position toward the storing position. Therefore, the tab becomes unstable at the operating position and operability of the rotation knob declines.

An art disclosed in the present application has been made in consideration of the problem described above and an object thereof is to enhance the operability of the rotation knob.

Solution to Technical Problem

An art disclosed in the present application is realized in a power tool. This power tool comprises a power tool body and a rotation knob rotatably arranged on the power tool body and operated by a user. The rotation knob comprises a knob body, a tab, a tab spring and a lock mechanism. The knob body is attached rotatably on the power tool body. The tab is attached on the knob body. The tab is supported being capable of swinging between an operating position projecting from the knob body and a storing position stored in one of the knob body and the power tool body. The tab spring biases the tab toward the operating position. The lock mechanism holds the tab at the storing position against the pressure of the tab spring in a case where the tab moves to the storing position.

With this rotation knob, in a case where the rotation knob is not operated, the tab may be retained at the storing position. When rotatably operating the rotation knob, by releasing locking that comprises the lock mechanism, the tab automatically moves from the storing position to the operating position due to a biasing force of the tab spring. The user may hold the tab and operate the rotation knob. At this point, the tab is maintained at the operating position by the biasing force of the tab spring. The tab is stabilized at the operating position. Consequently, the user may easily hold the tab and operate the rotation knob. Due to the above, according to the configuration described above, operability of the rotation knob may be enhanced.

For example, the lock mechanism may be configured so that in a case where the tab is at the storing position, the lock mechanism engages the tab to retain the tab at the storing position. Alternatively, the lock mechanism may be configured so that in the case where the tab is at the storing position, a magnetic force in an opposite direction to the biasing force of the tab spring retains the tab at the storing position.

The lock mechanism may comprise a lock member arranged on one of the knob body and the tab. The lock member may be movably arranged between a lock position engaging with another of the knob body and the tab and an unlock position disengaging the other of the knob body and the tab in a state where the tab is located at the storing position.

According to this configuration, when the lock member is moved from the lock position to the unlock position in a state where the tab is retained at the storing position, the tab automatically moves from the storing position to the operating position. The user need not perform troublesome operations when moving the tab to the operating position.

In this case, the lock mechanism may further comprise a lock spring biasing the lock member toward the lock position.

When the tab swings to the storing position and the lock member is capable of moving to the lock position, a surface of the tab may oppose a surface of one of the knob body or the power tool body with a clearance. The clearance may become gradually larger as a distance from a swinging axis of the tab increases.

According to this configuration, when swinging the tab from the operating position toward the storing position, the tab may be swung past a position where an engagement by the lock member occurs. As a result, even if a certain amount of deformation occurs on the lock member and the like, the lock member may be reliably engaged with the knob body and the tab.

The power tool may further comprise a ring member fixed on the power tool body and surrounding the tab and the knob body. In this case, a plurality of projecting portions may be disposed on the ring member along a circumferential direction thereof, on at least one of an end surface located opposite from the power tool body and an inner surface. The tab may comprise an engaging portion that engages with at least one of the plurality of projecting portions when the tab is positioned at the storing position.

According to this configuration, in a case where the tab is at the storing position, the rotation knob may be prevented from rotating relative to a device.

Advantageous Effects of Invention

According to the art disclosed in the present specification, the tab may be stabilized at the operating position. As a result, the operability of the rotation knob may be enhanced.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** shows an external view of a chain saw.

FIG. **2** shows an external view of a part of the chain saw.

FIG. **3** shows an enlarged view of an oil cap.

FIG. **4** shows an exploded perspective view of the oil cap.

FIG. **5** shows a cross-sectional view of a V-V cross section of FIG. **3**.

FIG. **6** shows a cross-sectional view of a state in which a tab is at an operating position.

FIG. **7** shows an enlarged view of a fixed operating knob.

FIG. **8** shows a cross-sectional view of a VIII-VIII cross section of FIG. **7**.

FIG. **9** shows a cross-sectional view of a IX-IX cross section of FIG. **7**.

FIG. **10** shows a state in which a lock member has moved to an unlock position.

FIG. **11** shows a state in which the tab is at the operating position.

FIG. **12** shows a state in which the tab is halfway from the operating position to a storing position.

FIG. **13** shows a state in which the tab is in contact with a knob body at the storing position.

FIG. **14** shows a fixed operating knob according to a first modification.

FIG. **15** shows a fixed operating knob according to a second modification.

FIG. **16** shows a fixed operating knob according to a third modification.

DESCRIPTION OF EMBODIMENT

Preferred Aspects of Invention

Preferred aspects of below embodiment will be listed.

(1) The rotation knob described above is favorably used in an oil cap of a chain saw. The chain saw comprises a chain saw body, a guide bar, a saw chain, an oil tank, and the oil cap. The guide bar is attached to the chain saw body so as to be capable of moving reciprocally relative to the chain saw body. The oil tank reserves lubricating oil that is supplied to the saw chain and the guide bar. The oil cap is rotatably arranged on the oil tank and closes an opening of the oil tank.

(2) The rotation knob described above is favorably used in a fixed operating knob that fixes the guide bar to the chain saw body. The fixed operating knob is rotatably arranged on the chain saw body.

(3) A swinging axis of the tab orthogonally intersects a center of rotation of the rotation knob.

(4) When the tab swings from a storing position to an operating position, the tab comes into contact with a knob body and swinging of the tab is thereby stopped.

Embodiment

An embodiment will now be described with reference to the drawings. FIG. **1** shows an external view of a chain saw **10**. FIG. **2** shows an external view of the chain saw **10** in a state in which a cover **24** and a saw chain **32** have been removed from a body **12** which will be described later. The chain saw **10** comprises the body **12**, a guide bar **30** attached to the body **12**, and the saw chain **32**.

As shown in FIGS. **1** and **2**, the body **12** comprises a motor **16**, a first grip **14**, a second grip **18**, and a sprocket **38**. A trigger switch **20** that activates the chain saw **10** is arranged on the second grip **18**. The sprocket **38** is arranged on a side surface of the body **12** and is rotatably supported by the body **12**. The sprocket **38** is connected to the motor **16** and is rotatably driven by the motor **16**. The motor **16** is configured so that power is supplied to the motor **16** from a battery **22** in conjunction with an operation performed on the trigger switch **20**. The battery **22** is detachably attached to the body **12**.

An oil tank, not shown, is arranged on the body **12**. The oil tank stores lubricating oil to be supplied to the saw chain **32**, the sprocket **38**, and the like. An opening **12***a* (refer to FIG. **5**) of the oil tank is closed by an oil cap **42**, which will be described in detail later. The oil cap **42** is rotatably attached to the body **12**.

The guide bar **30** is attached to the body **12**. The guide bar **30** is arranged adjacent to the sprocket **38**. The guide bar **30** is supported against the body **12** by a supporting bolt **34** and a supporting pin **36**. The supporting bolt **34** and the supporting pin **36** are fixed to the body **12** and support the guide bar **30** so that the guide bar **30** is capable of moving reciprocally relative to the body **12**. In other words, the guide bar **30** is arranged capable of approaching/retracting from the sprocket **38**. The saw chain **32**, not shown in FIG. **2**, is provided with tension between the sprocket **38** and the guide bar **30**. When an operator operates a wheel **26**, an adjusting pin **40** that engages with the guide bar **30** moves along a rotating shaft, not shown. Consequently, the operator can cause the guide bar **30** to approach/retract from the sprocket **38** and adjust the tension of the saw chain **32**.

A cover **24** that covers the sprocket **38** and a fixed operating knob **28** that is a rotation knob for fixing the guide bar **30** are arranged on a side surface of the body **12**. The fixed operating knob **28** is rotatably attached to the body **12**. The fixed operating knob **28** is screwed onto the supporting bolt **34** that projects from a side surface of the body **12**. When the fixed operating knob **28** is tightened relative to the supporting bolt **34**, the guide bar **30** becomes fixed to the body **12**, and when the fixed operating knob **28** is loosened relative to the supporting bolt **34**, the guide bar **30** becomes capable of moving reciprocally relative to the body **12**. The cover **24** is fixed by the fixed operating knob **28**. The cover **24** can be detached from the body **12** by detaching the fixed operating knob **28** from the supporting bolt **34**.

Next, operations of the chain saw **10** will be described. When the operator turns on the trigger switch **20**, the motor **16** that is a power source rotates. Due to a rotation of the motor **16**, the sprocket **38** is rotationally driven relative to the body **12**. Consequently, the saw chain **32** that is a tool rotates along the sprocket **38** and the guide bar **30**.

Next, a configuration of the oil cap **42** will be described. FIG. **3** shows an enlarged view of the oil cap **42**. FIG. **4** shows an exploded perspective view of the oil cap **42**. FIG. **5** shows a cross-sectional view of a V-V cross section of FIG. **3**. The oil cap **42** comprises a knob body **66**, a tab **50**, a lock member **58**, and the like. FIGS. **3** to **5** show a state in which the tab **50** is at a storing position. FIG. **6** shows a state in which the tab **50** is at an operating position on a same cross section as in FIG. **5**. The knob body **66** is rotatably attached relative to the body **12**. Washers **70** and **72** are attached to the knob body **66** on a side of the opening **12***a* of the oil tank. The washers **70** and **72** are sandwiched between the knob body **66** and a ring-like cap **74**. The knob body **66** has an opposing surface **66***a* that opposes a side surface **50***b* of the tab **50** on a side of the knob body **66** when the tab **50** is at the storing position, which will be described later, and a contacting surface **66***b* that comes into contact with the tab **50** when the tab **50** is at the operating position, which will be described later.

The tab **50** is attached to the knob body **66** and is capable of swinging. An opening **50***a* is formed at a center of swinging of the tab **50**. A swinging shaft (axis) **54** is inserted through the opening **50***a*. The swinging shaft **54** is arranged at a position at which the swinging shaft **54** orthogonally intersects a center axis of rotation of the oil cap **42**. The swinging shaft **54** is inserted through a torsion spring **52**. The torsion spring **52** biases the tab **50** from the storing position toward the operating position. A clearance **76** is provided between the side surface **50***b* of the tab **50** on the side of the knob body **66** and the opposing surface **66***a* when the tab **50** is at a position

where the tab **50** is locked by the lock member **58**. The clearance **76** gradually becomes greater as a distance from the swinging shaft **54** of the tab **50** becomes greater.

The tab **50** is locked to the storing position by the lock member **58**. The lock member **58** is slidably attached to the knob body **66**. The lock member **58** is slidably arranged relative to the knob body **66** between a lock position that locks the tab **50** to the storing position as shown in FIGS. **3** and **5** and an unlock position that disengages the locking of the tab **50** as shown in FIG. **6**. The lock member **58** is biased to the lock position by a spring **64**. The lock member **58** slides along a fixed guide member **56** of the knob body **66**. The lock member **58** has an engaging portion **60** that engages with an engaging portion **50***c* of the tab **50** when the tab **50** is at the storing position. An inclined surface **59** (an upper surface **59** in FIG. **5**) of the engaging portion **60** is inclined toward the knob body **66**.

The tab **50** is locked at the storing position by engaging with the engaging portion **60** of the lock member **58** at the lock position. The operator hooks a depressed part **62** of the lock member **58** with a finger to move the lock member **58** from the lock position to the unlock position shown in FIG. **6**. When the lock member **58** is moved to the unlock position, the tab **50** swings toward the operating position due to a biasing force of the torsion spring **52**. Swinging of the tab **50** is restricted as the tab **50** comes into contact with the contacting surface **66***b* of the knob body **66**. When the operator releases the lock member **58**, the lock member **58** moves from the unlock position to the lock position due to a biasing force of the spring **64**. When the tab **50** is at the operating position, the tab **50** projects from the knob body **66**. Consequently, the operator can hold the tab **50** and rotationally move the oil cap **42** relative to the body **12**.

When the tab **50** is pressed from the operating position toward the storing position, the tab **50** swings relative to the knob body **66**. As the tab **50** moves from the operating position to the storing position, the inclined surface **59** of the lock member **58** is pressed by the engaging portion **50***c* of the tab **50** and the lock member **58** is gradually moved toward the unlock position. When the tab **50** moves to the storing position, the contact between the inclined surface **59** of the lock member **58** and the engaging portion **50***c* is released. In other words, the lock member **58** is released from a pressing force from the tab **50**. As a result, the lock member **58** is moved to the lock position by a biasing force of the spring **64**. The tab **50** goes beyond a position at which the tab **50** is locked by the lock member **58** (a position of the tab **50** in FIG. **5**) and moves until the side surface **50***b* of the tab **50** comes into contact with the opposing surface **66***a* of the knob body **66**. When the operator releases the finger from the tab **50**, the tab **50** is moved by a biasing force of the torsion spring **52** to a position at which the tab **50** engages with the lock member **58** as shown in FIG. **5**. The tab **50** engages with, and is locked by, the lock member **58**.

Next, a configuration of the fixed operating knob **28** will be described. FIG. **7** shows an enlarged view of the fixed operating knob **28**. FIG. **8** shows a cross-sectional view of a VIII-VIII cross section of FIG. **7**. FIG. **9** shows a cross-sectional view of a IX-IX cross section of FIG. **7**. The fixed operating knob **28** comprises a knob body **166**, a tab **150**, a lock member **158**, a ring member **180**, a nut **184**, and the like. FIGS. **7** to **9** show a state in which the tab **150** is at the storing position. The knob body **166** has an opposing surface **166***a* that opposes a side surface **150***a* of the tab **150** on a side of the knob body when the tab **150** is at the storing position and a contacting surface (not shown) that comes into contact with the tab **150** when the tab **150** is at the operating position, which will be described later. The fixed operating knob **28** is attached to the body **12** by screwing the nut **184** into the supporting bolt **34**.

The tab **150** is attached to the knob body **166** via a swinging shaft (axis) **154** and is capable of swinging. The swinging shaft **154** is arranged at a position at which the swinging shaft **154** orthogonally intersects a center axis of rotation of the fixed operating knob **28** or, in other words, a position at which the swinging shaft **154** orthogonally intersects an axial direction of the supporting bolt **34**. The swinging shaft **154** is inserted through a torsion spring **152**. The torsion spring **152** biases the tab **150** from the storing position toward the operating position. A clearance **176** is provided between the side surface **150***a* of the tab **150** on the side of the knob body **166** and the opposing surface **166***a* when the tab **150** is at a position where the tab **150** is locked by the lock member **158**. The clearance **176** gradually becomes greater as a distance from the swinging shaft **154** of the tab **150** becomes greater.

The tab **150** is locked to the storing position by the lock member **158**. The lock member **158** is slidably attached to the knob body **166**. The lock member **158** is slidably arranged between a lock position that locks the tab **150** to the storing position as shown in FIGS. **7** and **8** and an unlock position (refer to FIG. **10**) that disengages the locking of the tab **150**. The lock member **158** is biased to the lock position by a spring **164**. The lock member **158** slides along a fixed guide member **156** of the knob body **166**. The lock member **158** has an engaging portion **160** that engages with an engaging portion **150***b* of the tab **150** when the tab **150** is at the storing position. An inclined surface **159** (an upper surface **159** in FIG. **8**) of the engaging portion **160** is inclined toward the knob body **166**.

FIG. **10** shows a state in which the lock member **158** has moved to an unlock position on the VIII-VIII cross section of FIG. **7**. When the lock member **158** is moved to the unlock position, the engagement between the tab **150** and the lock member **158** is released. As a result, the tab **150** swings toward the operating position due to a biasing force of the torsion spring **152**. Swinging of the tab **150** is restricted as the tab **150** comes into contact with the contacting surface of the knob body **166**. FIG. **11** shows a state in which the tab **150** is at the operating position. When the tab **150** is at the operating position, the tab **150** projects from the knob body **166**. Consequently, the operator can hold the tab **150** and rotationally move the fixed operating knob **28** relative to the body **12**. The lock member **158** is moved from the unlock position to the lock position by a biasing force of the spring **164**.

When the tab **150** is pressed from the operating position toward the storing position, the tab **150** swings relative to the knob body **166**. As shown in FIG. **12**, as the tab **150** moves from the operating position to the storing position, the inclined surface **159** of the lock member **158** is pressed by the engaging portion **150***b* of the tab **150** and the lock member **158** is gradually moved toward the unlock position. When the tab **150** moves to the storing position, the contact between the inclined surface **159** of the lock member **158** and the engaging portion **150***b* is released. In other words, the lock member **158** is released from a pressing force from the tab **150**. As a result, the lock member **158** is moved to the lock position by a biasing force of the spring **164**. As shown in FIG. **13**, the tab **150** goes beyond a position at which the tab **150** is locked by the lock member **158** (a position of the tab **150** in FIG. **8**) and moves until the side surface **150***a* of the tab **150** comes into contact with the opposing surface **166***a* of the knob body **166**. When the operator releases the tab **150**, the tab **150** is moved by a biasing force of the torsion spring **152** to a position at

which the tab **150** engages with the lock member **158** as shown in FIG. **8**. The tab **150** engages with, and is locked by, the lock member **158**.

With the fixed operating knob **28** according to the present embodiment, locking of the tab **150** is released by moving the lock member **158** from the lock position to the unlock position. Accordingly, the tab **150** is moved from the storing position to the operating position by the biasing force of the torsion spring **152**.

When the tab **150** is at the operating position, the tab **150** is brought into contact with the knob body **166** by the biasing force of the torsion spring **152**. As a result, the tab **150** stabilizes at the operating position. Accordingly, operability of the tab **150** is enhanced.

Similarly, with the oil cap **42**, locking of the tab **50** is released by moving the lock member **58** from the lock position to the unlock position and the tab **50** is moved from the storing position to the operating position. When the tab **50** is at the operating position, the tab **50** is brought into contact with the knob body **66** by the biasing force of the torsion spring **52**. As a result, the tab **50** stabilizes at the operating position. Accordingly, operability of the tab **50** is enhanced.

The lock member **158** is biased from the unlock position toward the lock position by the spring **164**. As the tab **150** swings from the operating position toward the storing position, the tab **150** comes into contact with the lock member **158** and moves the lock member **158** from the lock position to the unlock position. When the tab **150** is moved to the storing position, the lock member **158** is moved from the unlock position to the lock position by a biasing force of the spring **164**. As a result, when storing the tab **150** into the storing position, the tab **150** is automatically locked at the storing position without having to operate the lock member **158** and simply by moving the tab **150** from the operating position to the storing position.

Similarly, with the oil cap **42**, when the tab **50** swings from the operating position to the storing position, the lock member **58** is moved from the lock position to the unlock position. When the tab **50** is moved to the storing position, the lock member **58** is moved from the unlock position to the lock position by the biasing force of the spring **64**. As a result, when storing the tab **50** into the storing position, the tab **50** is automatically locked at the storing position without having to operate the lock member **58** and simply by moving the tab **50** from the operating position to the storing position.

With the fixed operating knob **28**, a clearance **176** is provided between the side surface **150***a* of the tab **150** and the opposing surface **166***a* of the knob body **166** when the tab **150** is at the position where the tab **150** is locked by the lock member **158**. In this configuration, when the tab **150** swings from the operating position to the storing position, the tab **150** goes beyond the position at which the tab **150** is locked by the lock member **158** and swings to a position at which the tab **150** comes into contact with the opposing surface **166***a*. Accordingly, as the lock member **158** moves from the unlock position to the lock position, a clearance can be formed between the engaging portion **160** of the lock member **158** and the engaging portion **150***b* of the tab **150**. Therefore, the engaging portion **160** and the engaging portion **150***b* need no longer be fabricated with high precision.

(Modifications)

Modifications of the fixed operating knob **28** according to the embodiment above will now be described with reference to the drawings.

FIG. **14** shows a fixed operating knob **228** of a first modification. In FIG. **14** and hereinafter, components similar to those of the fixed operating knob **28** will be denoted by similar reference characters to the embodiment described above and redundant descriptions thereof will be omitted.

A plurality of projecting portions **201** is formed on an upper surface of a ring member **180** of the fixed operating knob **228** or, in other words, on an end surface of the ring member **180** positioned on an opposite side to the body **12**. The projecting portions **201** are arranged at regular intervals along a circumferential direction of the ring member **180**. The upper ends of the projecting portions **201** are positioned on a same plane as an upper end surface of the tab **150** when the tab **150** is at a position where the tab **150** is locked by the lock member **158**. An engaging portion **203** that engages with the projecting portions **201** is formed on the tab **150**. The engaging portion **203** projects from the tab **150** toward the ring member **180**.

With the fixed operating knob **228**, when the tab **150** is at a storing position, an engagement between the projecting portions **201** of the ring member **180** and the engaging portion **203** of the tab **150** can prevent the tab **150** from rotating relative to the ring member **180**. Accordingly, wobbling of the guide bar **30** due to relaxing of a binding force between a nut **184** of the fixed operating knob **228** and the supporting bolt **34** of the body **12** can be prevented.

FIG. **15** shows a fixed operating knob **328** of a second modification. In FIG. **15** and hereinafter, components similar to those of the fixed operating knob **28** will be denoted by similar reference characters to the embodiment described above and redundant descriptions thereof will be omitted.

A plurality of projecting portions **301** is formed on an inner surface of the ring member **180** of the fixed operating knob **328**. The projecting portions **301** are arranged at regular intervals along a circumferential direction of the ring member **180**. An engaging portion **303** that engages with the projecting portions **301** is formed on the tab **150**. The engaging portion **303** projects from the tab **150** toward the ring member **180**.

With the fixed operating knob **328**, in the same manner as the fixed operating knob **228**, when the tab **150** is at a storing position, an engagement between the projecting portions **301** of the ring member **180** and the engaging portion **303** of the tab **150** can prevent the tab **150** from rotating relative to the ring member **180**.

FIG. **16** shows a longitudinal sectional view of a fixed operating knob **428** of a third modification. In FIG. **15** and hereinafter, components similar to those of the fixed operating knob **28** will be denoted by similar reference characters to the embodiment described above and redundant descriptions thereof will be omitted.

The fixed operating knob **428** comprises a knob body **466**, a tab **450**, a lock member **458**, a ring member **180**, and the like. FIG. **16** shows a state in which the tab **450** is at a storing position.

The tab **450** is attached to the knob body **166** via a swinging shaft **154** so as to be capable of swinging. The swinging shaft **154** is inserted through a torsion spring **152**. The torsion spring **152** biases the tab **450** from the storing position toward an operating position.

The tab **450** comprises a lock member **458**. The lock member **458** is slidably arranged relative to the tab **450** between a lock position at which the lock member **458** engages with a depressed part **470** of the ring member **180** to lock the tab **450** to the storing position and an unlock position that disengages the locking of the tab **450**. The lock member **458** is biased to the lock position by a spring **464**.

The lock member **458** comprises an engaging portion **458***a* that engages with the depressed part **470** of the ring member **180**. The engaging portion **458***a* is inclined toward an outer side of the tab **450** along a direction oriented from the storing

position toward the operating position. The plurality of depressed parts **470** that engages the lock member **458** is formed on an inner surface of the ring member **180**. The depressed parts **470** are arranged at regular intervals along a circumferential direction of the ring member **180**.

When the lock member **458** is moved from the lock position to the unlock position, the tab **450** swings from the storing position to the operating position due to the biasing force of the torsion spring **152**. At this point, the lock member **458** is moved from the unlock position to the lock position by a biasing force of the spring **464**. As the tab **450** is moved from the operating position toward the storing position, the engaging portion **458***a* of the lock member **458** comes into contact with an upper end (an upper end shown in FIG. **16**) of the ring member **180**. Accordingly, the lock member **458** gradually moves from the lock position to the unlock position. When the tab **450** reaches the storing position, the engaging portion **458***a* is inserted into the depressed parts **470** of the ring member **180**. Accordingly, the tab **450** is locked at the storing position by the lock member **458**.

A similar advantageous effect to the embodiment described above can also be achieved by the fixed operating knob **428**. The engaging portion **458***a* of the lock member **458** is inserted into the depressed parts **470** of the ring member **180**. Accordingly, the engaging portion **458***a* engages with projecting portions between adjacent depressed parts **470** and prevents a rotation of the tab **450**.

Specific embodiment of the present teachings is described above, but this merely illustrates some representative possibilities for utilizing the teachings and does not restrict the claims thereof. The subject matter set forth in the claims includes variations and modifications of the specific examples set forth above.

For example, the embodiment described above adopts a mechanism in which the tabs **50**, **150**, and **450** are locked by an engagement between the lock members **58**, **158**, and **458** and the tabs **50**, **150**, and **450** or the ring member **180**. However, for example, the locking mechanism may involve locking the tabs **50**, **150**, and **450** to the storing position by a magnetic force.

In addition, the lock members **58**, **158**, and **458** need not be biased from the unlock position toward the lock position by the springs **64**, **164**, and **464**.

A chain saw **10** comprising a fixed operating knob **28** that is a rotation knob and a oil cap **42** is described in the embodiment above. However, in addition to the chain saw **10**, the rotation knob described in the present specification can be applied to various power tools such as a hedge cutter or a grass clipper, a hedge trimmer, a push mower, a grass cutter, and a bush cutter.

The technical elements disclosed in the specification or the drawings may be utilized separately or in all types of combinations, and are not limited to the combinations set forth in the claims at the time of filing of the application. Furthermore, the subject matter disclosed herein may be utilized to simultaneously achieve a plurality of objects or to only achieve one object.

The invention claimed is:

1. A power tool comprising:
a power tool body; and
a rotation knob rotatably arranged on the power tool body and operated by a user,
wherein the rotation knob comprises:
a knob body attached rotatably on the power tool body;
a tab attached on the knob body and capable of swinging between an operating position projecting from the knob body and a storing position stored in one of the knob body and the power tool body;
a tab spring biasing the tab toward the operating position; and
a lock mechanism holding the tab at the storing position against the pressure of the tab spring in a case where the tab moves to the storing position.

2. The power tool as in claim **1**, wherein
the lock mechanism comprises a lock member arranged on one of the knob body and the tab, and
the lock member is movably arranged between a lock position engaging with another of the knob body and the tab and an unlock position disengaging the other of the knob body and the tab in a state where the tab is located at the storing position.

3. The power tool as in claim **2**, wherein
the lock mechanism further comprises a lock spring biasing the lock member toward the lock position.

4. The power tool as in claim **2**, wherein
when the tab swings to the storing position and the lock member is capable of moving to the lock position, a surface of the tab opposes a surface of one of the knob body or the power tool body with a clearance, and
the clearance becomes gradually larger as a distance from a swinging axis of the tab increases.

5. The power tool as in claim **1**, further comprising:
a ring member fixed on the power tool body and surrounding the tab and the knob body,
wherein a plurality of projecting portions is disposed on the ring member along a circumferential direction thereof, on at least one of an end surface located opposite from the power tool body and an inner surface, and
the tab comprises an engaging portion that engages with at least one of the plurality of projecting portions when the tab is positioned at the storing position.

* * * * *